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Corning 925/926 Chloride Meter Service Manual

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Section 1

Introduction

1.1 Introduction

The 925 and 926 are direct reading, digital chloride meters. The 925 is designed for fast and accurate determinations of chloride levels in biological samples. Sample volume can be 20ul or 100ul and results are displayed on a digital readout in mmolCl/l (millimoles of chloride per litre). The 926 is designed for fast and accurate determinations of chloride in industrial samples. Sample volume is 0.5ml and results are displayed in mg/l (milligrams per litre) or mg% (milligrams per cent) salt.

The 925 CMNA version will perform twenty titrations and the CME version fifty titrations before the 'change reagents' LED indicator is illuminated. From Instrument Serial No. 925/1381 a soldered wire link is fitted and from Serial No. 925/1551 a link selector is fitted to select 20 or 50 sample capability. The 926 has a capability of five samples which is the same for all 926 instruments.

Selection of 925 or 926 mode is by SW4 on instrument up to Serial Nos. 925/1550 and 926/1120, instruments above these Serial Nos. are fitted with a link selector.

The CME (IEC) version of the 925 and 926 has two fuses (line and neutral) but the CMNA (UL) version has fuse F1 only. Refer to Figure 1 at the back of this service manual.

The 'power on/off' switch, on the rear panel, is fitted to instruments above Serial Nos. 925/1550 and 926/1120 only.

This service manual covers the 925 and 926 CME and CMNA versions and contains sufficient information to service all instruments.

IMPORTANT From Serial No. 925/1591 and 926/1131 the Anode and Cathode positions are transposed on electrode head board and stirrer speed changed to 1700 rpm with 20mm stirrer bar. Please update the following items in this manual:-

Section 4 Figure 4.1 - items 1 & 2 - positions transposed.

EV1 Spares

Item 6 transposed with one of item 7, the front one.
Item 8 stirrer, paddle now 20mm, was 13mm.

Spares List

Item 8 - 92511006M - stirrer 13mm. Use on units up to serial no: 925/1590 and 926/1130 only. Add 92514001P stirrer 20mm for all units, with new 1700 rpm motor.

Item 13 stirrer motor - 92509001L- is now supplied complete with 20mm stirrer.

Item 21 - 92508001P - now supplied with Anode and Cathode sockets transposed.



Section 2

Controls and Services

2.1 Controls

The 'power' and 'change reagents' LED indicators and 'condition' and 'titrate' pushbuttons have the same function on both the 925 and 926. The displays are both 3 digit, reading in mmol/l on the 925 and mg/l or mg% salt on the 926. The display codes are the same.

power

Green, LED indicator that is on when 925/926 is connected to an a.c. supply.

change reagents

Yellow, LED indicator that is illuminated when fifty(twenty) 100ul or 20ul samples on the 925 or five 0.5ml samples on the 926 have been titrated. A further two samples can be titrated, if required, before changing the reagents.

condition

Pushbutton that when depressed initiates the conditioning cycle. The conditioning cycle must be run each time the instrument is switched on, each time reagents are changed and, on the 925 only, each time the sample volume size is changed. The purpose of the conditioning cycle is to titrate out any chloride present in the reagents or beaker, so that the subsequent titration is accurate. The 'condition' pushbutton also resets the sample number counter, which controls the 'change reagents' LED indicator and the E02 error code.

titrate

This pushbutton, when depressed, initiates a titrate cycle. During a titration the stirrer operates for approximately 5 seconds before the readout is set to zero. The chloride is then titrated out of the solution while the readout is incremented. When all the chloride is titrated the readout is stopped and held.

The 'titrate' pushbutton is inoperative following switch on and after an E02 error code is displayed. In each case this ensures that a condition cycle is carried out first. This prevents an erroneous result on the first titration due to chloride being present in the reagents or beaker.

power on/off

Rear panel switch that controls the line and neutral supplies. Refer to Figure 1.

Display Codes

The following display codes will appear in place of the measured value.

| <u>Code</u> | <u>Indication</u> |
|-------------|--|
| CCC | A condition cycle is in progress. |
| E01 | The display has counted past 299 (925) or past 999 (926). |
| E02 | Reagents must be renewed. Initiated when a 53rd (23rd) titration (925) or 8th titration (926) is attempted after a conditioning cycle; no titration will take place. |
| E03 | No sample present. |

925 CONTROLS

20ul sample

This pushbutton controls the sample size selection, 20ul or 100ul. The '20ul sample' LED is illuminated when micro sample volume (20ul) is selected. When the LED is not illuminated 100ul sample volume is selected. The LED indicator is also illuminated during the automatic check routine that is run by the 925 each time it is switched on.

Calibrate Controls

The two calibrate controls are accessible via two holes in the righthand side panel. The calibrate controls determine the speed at which the display is updated and, therefore, the final result. There are two controls, RV2 for 100ul samples and RV1 for 20ul samples. The 925 adjustment procedure is detailed in Section 4.3.

926 CONTROLS

mg% salt

This pushbutton selects the units in which the final reading is displayed. The 926 carries out all measurements in units of mgCl/l and only calculates the final result in mg% salt, after titration is complete. The pushbutton is inhibited until a condition cycle and the first titration cycle have been run, so the 'mg% salt' LED indicator only illuminates after the first titration. This enables any result to be displayed in 'mgCl/l' or 'mg% salt' simply by selecting the alternate display mode.

Calibrate Control

The calibrate control is accessible via a hole in the righthand side panel. The calibrate control, RV1, determines the speed at which the display is updated and, therefore, the final result. The 926 adjustment procedure is detailed in Section 4.4.

925/926 Selector Switch/Selector Link

The switch SW4 or link LK1 is mounted on the PCB and determines the operating mode of the instrument.

2.2 Changing the Operating Voltage

To adjust the voltage selector carry out the following:

1. Disconnect the instrument from the a.c. supply, and remove the a.c. supply lead from the rear panel connector.
2. Remove the six rear panel retaining screws, item 1, Figure 2.1.

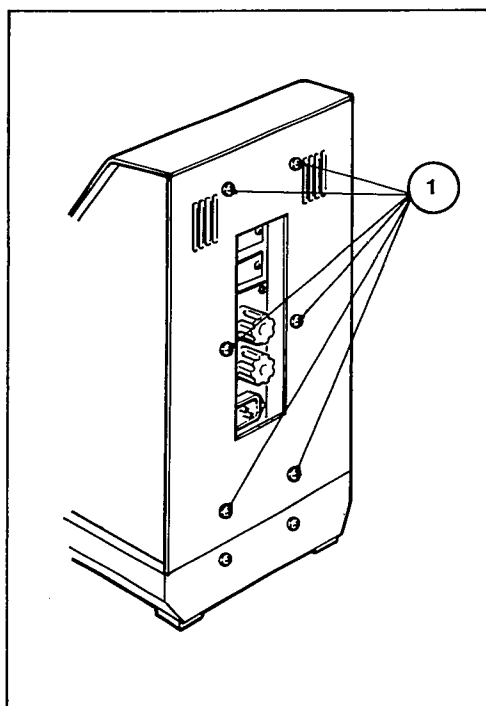


Figure 2.1 Rear Panel Retaining Screws

1. Retaining screws

3. Withdraw the Rear and Side Panel assembly from the instrument.

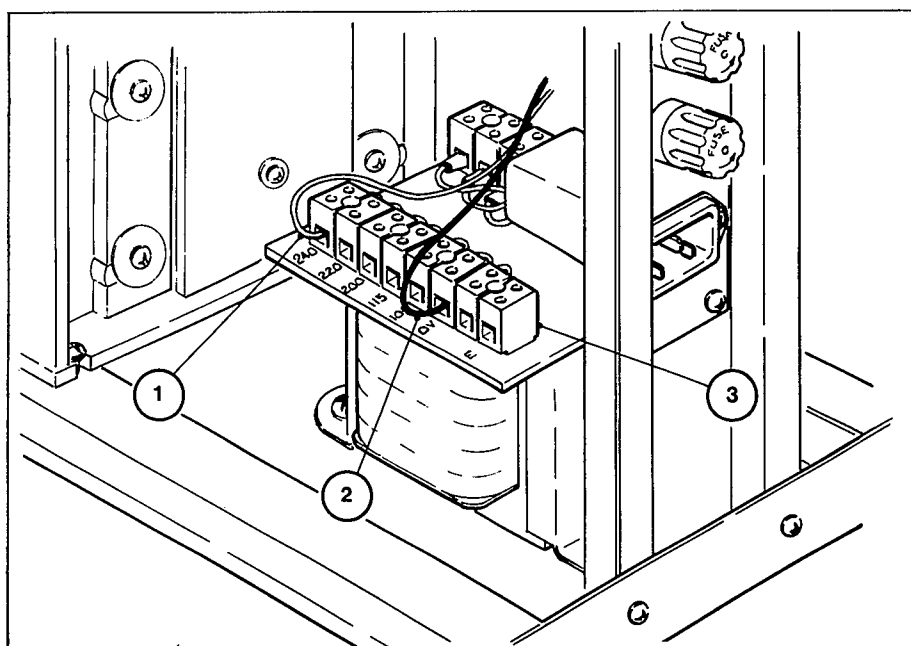


Figure 2.2 Voltage Selector

1. Brown lead 2. Blue lead 3. Terminal block

4. Locate the voltage selector terminal block, refer to Figure 2.2, and disconnect the brown lead.
5. Reposition the brown lead to suit the local supply, and tighten the terminal screw.
6. Replace the Rear and Side Panel assembly and refit the six retaining screws.
7. Fit the a.c. supply lead to the rear panel connector.
8. Refer to Section 4.3 (925) or 4.4 (926) and check the calibration.

Section 3

Instrument Description

3.1 General

The instrument operation is divided into three sections.

Self Test Routine

The instrument is programmed to carry out a simple self test routine immediately following connection to an a.c. supply. The visual indication that this is in progress is the display starting at FFF and then cycling through 000 to 999 and returning to 000, plus all front panel LED's are switched on during the test. When operating as a 925 the 20ul LED will remain on after the test routine if 20ul sample volume is selected. When 926 operation is selected the mg% salt LED will always go off. Even when readout in mg% salt is selected, this LED will remain off until the first titration is completed.

Conditioning Cycle

When fresh buffer solution is put into the beaker, it is necessary to remove any chloride from that solution before titrating samples. Hence, either after connection/self test, or after changing solutions, and after changing sample volume size on the 925, the instrument will only carry out a conditioning cycle. During conditioning the acid buffer is titrated for a short period to ensure that the small traces of chloride are removed.

Sample Titration

Chloride is titrated by passing a known, constant current between two silver electrodes which provides a constant generation of silver ions. These silver ions combine with the chloride in the sample and precipitate silver chloride.

When all the chloride has been precipitated as silver chloride, free silver ions begin to appear and the solution conductivity changes. This change is detected by the sensing electrodes and the readout is stopped, displaying the results directly in millimoles of chloride (925) and milligrams of chloride per litre or milligrams % salt (926).

During the period of the titration, pulses, produced by an oscillator, are counted by a microprocessor. The number of pulses counted is proportional to the amount of chloride in the sample.

3.2 Mechanical

Refer to EV1 when reading the following description.

The case is made up of a plastic injection moulding and sheet metal. The base is a sheet metal fabrication, with the plastic moulding and back strut mounted on it. The plastic moulding forms the lower half of the front panel. The upper half and top are formed from sheet metal, which is attached to the top of the back strut to provide a rigid structure. The rear and side panels form a single unit, which is attached to the back strut.

All electronic components are mounted on the single PCB which is fitted to the rear of the upper front panel. LED indicators and pushbuttons are mounted on the PCB and protrude through cutouts in the upper front panel. The stirrer motor and electrode sockets are mounted on the motor plate, which is fitted into the lower front panel from the rear. The beaker platform slides up and down, to facilitate removal of the beaker, and has a catch to provide positive location in the fully raised position.

The a.c. supply transformer is mounted on the base and has a voltage selector terminal block on top.

There are three plates on the back strut, two are blanking plates and the third has the two fuse holders and the a.c. supply connector mounted on it. The a.c. supply connector incorporates an a.c. supply filter.

NOTE CMNA (UL) instruments have fuse F1 only. Refer to Figure 1.

The differences between a 925 and 926 are different front panel overlays and side panel colours - 925 side panels are orange and 926 side panels are grey.

3.3 Electrical

IC1, IC2, IC3, IC4 provide regulated +15V, -15V, +5V and 12V supply rails which are used to power the instrument. The supplies are derived from separate secondaries, and rectified by MR1, MR2, MR3 and MR4 respectively. The 12V rail is a floating supply (i.e. it is isolated from the other supplies and from 0V).

IC7 is a single chip microprocessor integrated circuit. This device is programmed internally to carry out all the necessary instrument functions in response to inputs from switches and other circuitry. It also produces outputs to control the measuring circuitry, and multiplexed display signals to IC6.

IC6 is the demultiplexer/display driver integrated circuit. It accepts the multiplexed data from the microprocessor on pins 27, 28, 29 and 30, and the coded 'digit' select inputs on pins 31 and 32. It also produces constant current 7 segment LED display signals which give the appropriate reading on the displays DIS 1, 2 and 3.

MR5 and C13 rectify and smooth an a.c. secondary voltage from the transformer to provide an unregulated supply for the stirrer motor. The stirrer motor is controlled by transistor VT5, which is switched by signals received from the microprocessor (IC6, pin 22). The stirrer motor is turned on during measurement and conditioning cycles.

The sensing circuitry comprises IC9, VT9 and IC10. It monitors the samples being measured for presence of free silver, which indicates 'end of titration'.

A reference voltage is produced for the sensing electrodes by R36 and D6. When free silver appears in the sample, current flow increases between the two electrodes, which is sensed by R41. When the current exceeds a predetermined limit, the comparator, IC9 changes state (from 0V to +11V) turning on transistor VT9.

When VT9 turns on, it switches current through an LED in IC10. IC10 is an optocoupled isolating device. VT9 turns on the LED in IC10, the light from which turns on a transistor (also within IC10) and this produces a logic '0' (= titration ended) signal from IC10, pin 5, which is fed to the microprocessor.

It is important that the sense electrodes are not affected by the current from the generator electrodes and so the whole sense electrode circuitry is driven from the 'floating' 12 volt supply. This, plus the isolator (IC10) ensures that there is no electrical connection to the sense circuitry from other circuits.

VT3 is the 'electrodes up' (beaker down) indication. When insufficient current is flowing between the generator electrodes to provide at least 0.7V across R30 (or R30 in parallel with R31), VT3 is switched off, giving a logic '1' input to the processor, pin 32, indicating 'electrodes out of solution'.

The titration is performed by the constant current passing between the generator electrodes. The constant current flowing in the solution is monitored by R30 (or R30 in parallel with R31). This voltage is compared with a reference voltage, produced by D7, and any difference is amplified by IC8. The output of IC8 drives the current generator transistor VT6, and by using this closed loop system the generator current is maintained at a constant level during the relevant period of the titration.

VT4 and VT7 are switching transistors that are commanded by the microprocessor to switch the current generator on and off at the appropriate times.

When operating as a 925 in the 20ul mode, R30 is used to control the titration current at a constant level (nom 9.3mA). In the 100ul mode, a logic '1' from the processor (pin 36) turns on VT8 which energises RLA. One set of contacts of RLA switches R31 in parallel with R30, so the titration current is controlled at a higher level (46mA nom). The other set of contacts of RLA are used to select the frequency of oscillator IC12. When operating as a 926 RLA is de-energised and R30 is used to control the titration current and RV1 is used to set the oscillator frequency.

IC12 forms the measurement oscillator. The number of pulses counted by the microprocessor from this oscillator during the titration period determines the reading displayed. The frequency of the oscillator is determined by either RV1, R2, R4, C14 or RV2, R3, R4, C14. The preset controls RV1 and RV2 are set so that the instrument displays the correct reading when known value samples are titrated. (RV1 is 20ul cal control, RV2 is 100ul cal control for 925 operation; RV1 is the 'count adjust' control for 926 operation, RV2 is not used). Associated parts of IC5 buffer the oscillator from the microprocessor circuits.

Other parts of IC5 are used to drive the 'change reagents' and '20ul/mg%' LED displays.

925/926 operating mode is determined by SW4 on Instruments up to Serial Nos. 925/1550 and 926/1120. Instruments above these Serial Nos. are fitted with a link selector, LK1.



Section 4

Maintenance

4.1 General

The 925 and 926 have been designed to reduce the need for regular maintenance to a daily check, by the operator, of the electrodes. Electrode Cleaning and Replacement is described in Section 4.2 and the Calibration procedure is described in Section 4.3 for the 925 and Section 4.4 for the 926.

WARNING When used in a Pathology Laboratory, cleaning of component parts of the 925, such as sample beaker, stirrer or electrodes should only be carried out after decontamination with a bacteriocidal agent.

4.2 Electrode Cleaning and Replacement

Equipment Required:

Corning Electrode Polish

Soft cloth

One cathode and two detecting electrodes) as required

One anode)

1. Remove the four electrodes by withdrawing them downwards from the electrode head. Note that the anode (item 1, Figure 4.1) is longer than the other three electrodes.

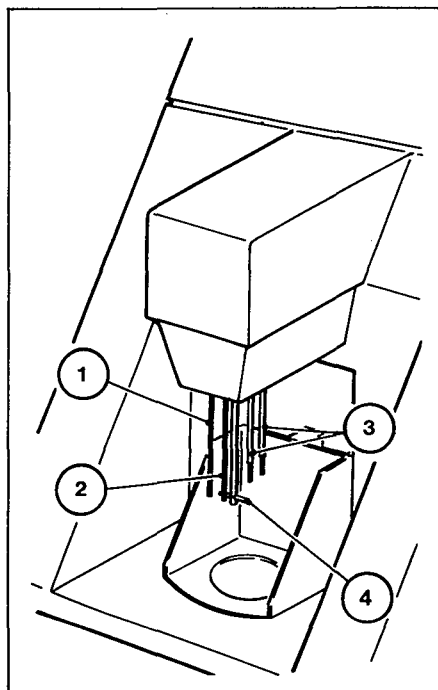


Figure 4.1 Electrodes and Electrode Head

1. Anode 2. Cathode 3. Sense electrodes 4. Stirrer

2. If the length of the anode is less than 57mm discard it and fit a replacement.
3. Place a little Corning Electrode Polish on a soft cloth and gently rub the exposed parts of the electrodes until they are clean and bright.

NOTE Ensure when refitting the sense electrodes that the exposed ends are not touched with the fingers. The instrument will not condition if the sense electrodes are contaminated. Handle only by the sleeved sections.

4. Refit the electrodes, ensuring that with the cathode and sense electrodes fully inserted, the anode is adjusted to the same length.
5. Place a beaker of deionised water on the sample lift and immerse the electrodes.
6. Carry out three condition cycles.
7. Remove the beaker and wipe the electrodes with a soft cloth.
8. Carefully inspect the electrodes to ensure that they are clean. If they are not repeat paragraphs 1 to 7. If they are still not clean fit replacements, ensuring that they are fully inserted.
9. Adjust the vertical position of the anode so that it is the same length as the other electrodes.
10. Check that all electrodes are straight and parallel, adjusting them as necessary.
11. Calibrate the instrument as detailed in Section 4.3 for the 925 or Section 4.4 for the 926.

4.3 925 Calibration Procedure

Equipment Required:

20ul pipette
100ul pipette
Thymol Blue Gelatin Indicator, CME only
100 mmolCl/I Standard Solution
Acid Buffer CME; Acid Buffer with Chloride CMNA
Insulated screwdriver, flat blade, blade width 3 mm (1/8")

1. Connect the 925 to an a.c. supply and check that:
 - 'power', '20ul sample' and 'change reagents' indicators are illuminated.
 - all digits on the readout are displayed in sequence from FFF, then 000 through to 999.

2. Check that 'change reagents' indicator is off when readout returns to 000. If the '20ul sample' indicator remains on, depress the '20ul sample' pushbutton to select 100ul sample volume.

NOTE All three electrodes go black in use, this is normal and cleaning is only required if the instrument will not condition.

3. Add Acid Buffer to the mark in a clean sample beaker.

NOTE If using Acid Buffer with Chloride ignore paragraph 4 (adding Thymol Blue) and paragraph 7 (adding Standard Solution).

4. Add 5 drops of Thymol Blue Gelatin Indicator Solution to the Acid Buffer.
5. When the 925 has been switched on for 5 minutes, continue with the calibration.
6. Place the sample beaker on the platform and raise the platform, until it locates in the raised position.
7. Pipette 100ul of 100 mmolCl/I Standard Solution into the beaker.
8. Depress 'condition' pushbutton.
9. Immediately CCC will be displayed on the readout, indicating that conditioning is in progress.
10. When the stirrer stops and the display reads 000, pipette another 100ul of 100 mmolCl/I Standard into the beaker.
11. Depress 'titrate' pushbutton.
12. Carry out five titrations using 100 mmolCl/I Standard Solution, noting each reading. If the five readings are not reproducible to within ± 2 mmol, refer to Section 5, Troubleshooting.

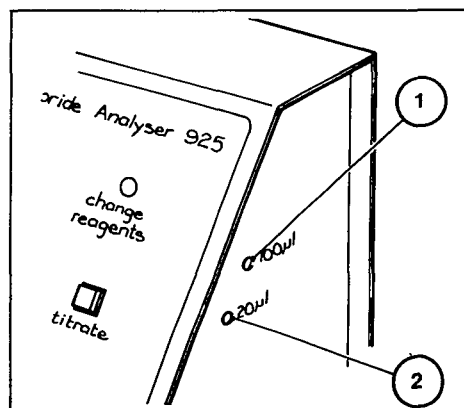


Figure 4.2 Calibrate Controls

1. 100ul calibrate control
2. 20ul calibrate control

13. Calculate the mean of the five readings, which should be between 99.5 and 100.5 mmolCl/l. If it is, continue with paragraph 16. If not, continue with paragraph 14.
14. Using a screwdriver adjust the 100ul calibrate control through the hole in the side panel, item 1, Figure 4.2. If the reading is low adjust the control clockwise, if high adjust control counterclockwise. The sensitivity is approximately a change of 8 mmol for one complete rotation.
15. Repeat paragraphs 12 to 14 until the mean result is within the range 99.5 to 100.5.
16. Depress '20ul sample' pushbutton. Check that '20ul sample' indicator is illuminated.
17. Add 20ul of 100 mmolCl/l Standard Solution and depress 'condition' pushbutton
18. Repeat paragraphs 12 to 15, noting that the five readings must be reproducible to within ± 4 mmol and, if necessary, the 20ul calibrate control should be adjusted to obtain a mean between 99 and 101.

4.4 926 Calibration Procedure

Equipment Required:

0.5ml pipette
Thymol Blue Gelatin Indicator, CME only
200 mgCl/l Standard Solution
Acid Buffer CME; Acid Buffer with Chloride, CMNA
Insulated screwdriver, flat blade, blade width 3 mm (1/8")

1. Connect the 926 to an a.c. supply and check that:
 - 'power', 'mg% salt' and 'change reagents' indicators are illuminated.
 - all digits on the readout are displayed in sequence from FFF, then 000 through to 999.
2. Check that 'change reagents' and 'mg% salt' indicators are off when readout returns to 000.

NOTE All three electrodes go black in use, this is normal and will not affect performance.

3. Add Acid Buffer to the mark in a clean sample beaker.

NOTE If using Acid Buffer with Chloride ignore paragraph 4 (adding Thymol Blue) and paragraph 7 (adding Standard Solution).

4. Add 5 drops of Thymol Blue Gelatin Indicator Solution to the Acid Buffer.
5. When the 926 has been switched on for 5 minutes, continue with the calibration.

Corning Information Service

All Corning products are subject to a programme of continuous evaluation and development. As components and techniques are improved, the service requirements for an instrument may change.

If you would like to receive revised service information for the instrument covered by this manual, fill out and return the attached card.

Name _____

Position _____

Organisation _____

Address _____

925/926 Chloride Analyzers

**Technical Services Department
Corning Medical and Scientific
Corning Limited
Halstead Essex
CO9 2DX England**

6. Place the sample beaker on the platform and raise the platform, until it locates in the raised position.
7. Pipette 0.5ml of 200 mgCl/l Standard Solution into the beaker.
8. Depress 'condition' pushbutton.
9. Immediately CCC will be displayed on the readout, indicating that conditioning is in progress.
10. When the stirrer stops, pipette another 0.5 ml of 200 mgCl/l Standard into the beaker.
11. Depress 'titrate' pushbutton.
12. When titration is complete and stirrer has stopped, select mgCl/l mode, i.e. 'mg% salt' indicator off.
13. Carry out five titrations using 200 mgCl/l Standard Solution, noting each reading. If the five readings are not reproducible to within ± 3 , refer to Section 5, Troubleshooting.
14. Calculate the mean of the five readings, which should be between 198.5 and 201.5 mgCl/l. If it is, no further action is required. If not, continue with paragraph 15.
15. Using a screwdriver adjust the 'count adjust' control through the hole in the side panel, item 1, Figure 4.3. If the reading is low adjust the control clockwise, if high adjust control counterclockwise. The sensitivity is approximately a change of 16 mgCl/l for one complete rotation.

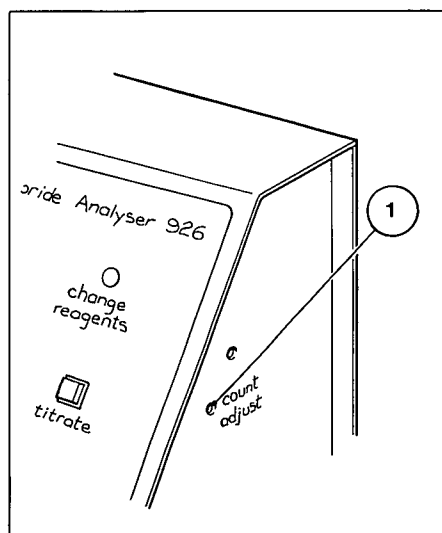


Figure 4.3 Calibrate Control

1. 'Count adjust' control

16. Empty and rinse beaker and repeat paragraphs 3 to 15 until the mean result is within the range 198.5 to 201.5.



Section 5

Troubleshooting

5.1 General

The 925/926 is a relatively simple instrument with all electronic components mounted on a single PCB. The recommended policy for correcting faults is to replace the PCB.

IMPORTANT When replacing a PCB always check the setting of SW4 or LK1, the 925/926 selector switch/link.

If the fault persists it should be easy to correct, as the only items not mounted on the PCB are the fuses, transformer, stirrer motor and electrode sockets, together with connectors and wiring.

To troubleshoot the PCB, refer to Section 5.2.

5.2 PCB Troubleshooting

The following information will be useful when checking the PCB:

Power Supplies

| <u>Voltage</u> | <u>Connect across</u> | <u>Reading</u> | <u>Ripple maximum</u> |
|----------------|-----------------------|------------------|-----------------------|
| +15V | TP1 and TP2 | +13.5V to +16.5V | 50mVpp (Note 1) |
| -15V | TP2 and TP3 | -13.5V to -16.5V | 10mVpp |
| + 5V | TP4 and TP5 | +4.75V to +5.25V | 10mVpp |
| +12V | TP6 and TP7 | +10.8V to +13.2V | 10mVpp |
| Motor supply | C13 | +13V to +19V | 2.5Vpp (Note 2) |

NOTE 1 Maximum ripple with IC7 connected.

NOTE 2 Measured with 180 ohm load between PL6 pins 2 and 10.

Displays

These checks are carried out with IC7 removed.

CAUTION Before removing or replacing an IC disconnect the instrument from the a.c. supply. Handle IC's carefully and avoid touching the pins. Before removing a new IC from its packaging touch the black conductive foam to equalise the stray potential.

| <u>Diode</u> | <u>ON/OFF</u> | <u>Conditions</u> |
|--------------|---------------|-----------------------------------|
| D2 | ON | When a.c. supply connected |
| D3 | OFF | Less than +0.5V on IC7, pin 23 |
| D3 | ON | Greater than +1.9V on IC7, pin 23 |
| D4 | OFF | Less than +0.5V on IC7, pin 35 |
| D4 | ON | Greater than +1.9V on IC7, pin 35 |

Switches

These checks are carried out with IC7 removed. To avoid damaging IC7 refer to CAUTION in Displays section, page 1.

| <u>Switch</u> | <u>Operation</u> | <u>Reading IC7</u> |
|---------------|----------------------------------|------------------------|
| SW1 | Press & hold | Pin 29 less than 0.2V |
| SW1 | Released | Pin 29 greater than 3V |
| SW2 | Press & hold | Pin 28 less than 0.2V |
| SW2 | Released | Pin 28 greater than 3V |
| SW3 | '20ul' or 'mg% salt' selected | Pin 1 less than 0.2V |
| SW3 | '100ul' or 'mgCl/I' selected | Pin 1 greater than 3V |
| SW4/LK1 | 926 selected | Pin 31 greater than 3V |
| SW4/LK1 | 925 selected | Pin 31 less than 0.2V |

Measurement Oscillator and Range Switching

These checks are carried out with IC7 removed. To avoid damaging IC7 refer to CAUTION in Displays section, page 1.

Apply a d.c. voltage greater than +2.4V to IC7 pin 36, with reference to TP2. RLA should energise. The oscillator frequency at IC7 pin 39 should be adjustable between 8.4 kHz and 10.75 kHz by RV2.

Apply a d.c. voltage less than 0.45V to IC7 pin 36, with reference to TP2. RLA should be de-energised. The oscillator frequency at IC7 pin 39 should be adjustable between 8.4 kHz and 10.75 kHz by RV1.

Motor Drive

These checks are carried out with IC7 removed. To avoid damaging IC7 refer to CAUTION in Displays section, page 1.

Connect a 150 ohm, 2 Watt resistor between PL6 pins 2 and 10. Apply greater than +2.4V to IC7 pin 22, with reference to TP2. Check that the voltage across PL6 pins 2 and 10 is between +9.5V and +15V. Apply less than 0.4V to IC7 pin 22, with reference to TP2. Check that the voltage across PL6 pins 2 and 10 is less than 0.2V.

Current Generator

These checks are carried out with IC7 removed. To avoid damaging IC7 refer to CAUTION in Displays section, page 1.

Connect a 100 ohm, 1/2 Watt, 2% resistor between PL2 pins 1 and 3. Apply a d.c. voltage greater than +2.4V to IC7 pins 21 and 36, with reference to TP2. Check that the voltage across PL2 pins 2 and 3 is less than 0.01V.

Apply a d.c. voltage less than 0.45V to IC7 pin 36, with reference to TP2. Check that the voltage across PL2 pins 1 and 3 is less than 0.01V.

Apply a d.c. voltage less than 0.45V to IC7 pin 21 and a d.c. voltage greater than 2.4V to IC7 pin 36, with reference to TP2. Check that the voltage across PL2 pins 1 and 3 is between +4.2V and +5V and across PL2 pins 2 and 3 is between +2.4V and +2.59V.

Apply a d.c. voltage less than 0.45V to IC7 pin 36, with reference to TP2. Check the voltage across PL2 pins 1 and 3 is between +0.86V and +1V. Check that the voltage across PL2 pins 2 and 3 is between +2.42V and +2.59V.

Apply less than +0.45V to IC7 pin 21 and greater than +2.4V to IC7 pin 36. Check that the voltage at IC7 pin 32 is less than +0.45V. Remove the 100 ohm resistor and check that IC7 pin 32 voltage is greater than 2.4V, with reference to TP2.

The voltage across PL2 pins 4 and 5 should be between +0.21V and +0.35V and at IC7 pin 27 should be greater than +2.4V, with reference to TP2. Connect the 100 ohm resistor between PL2 pins 4 and 5 and check that the voltage at IC7 pin 27 is less than 0.4V, with reference to TP2.

5.3 Stirrer falls out of Coupling

If this fault is apparent check that the protective boot is correctly positioned and is not touching the stirrer shaft. If it is touching the shaft, carry out the following adjustment procedure.

NOTE Item numbers refer to EV1.

1. Disconnect instrument from a.c. supply.
2. Remove rear and side panel assembly.
3. Remove PCB assembly.
4. Remove stirrer and the four electrodes.
5. Remove the two screws securing the motor mounting plate, item 19.
6. Withdraw the motor mounting plate.
7. Fit the stirrer to ascertain the amount of adjustment required.
8. Remove stirrer and protective boot.
9. Slacken the two screws which secure the electrode board assembly, item 21 and adjust its position on the motor mounting plate.
10. Tighten the two securing screws, refit protective boot and stirrer. Recheck clearance around stirrer.
11. Repeat paragraphs 8, 9 and 10 until adjustment is satisfactory.
12. Reassemble instrument and check that stirrer is secure.

5.4 Instrument will not Condition

This fault can be caused by contamination of the sense electrodes. Clean the electrodes as detailed in Section 4.2 and ensure when refitting them that the exposed ends are not touched with the fingers. Always handle by the sleeved sections.

Section 6

Spares

6.1 Ordering Information

The following information will be required when ordering spares:

Unit Serial No.
Catalog No. of part
Quantity required

The CME Engineers Spares Kit is listed in Section 6.2; the CMNA Field Service Kit is listed on page 3. These spares are also included in the listings shown opposite EV's 1 and 2. The PCB mounted components are listed on EV3.

The Catalog numbers are composite numbers and can be used by Corning Medical America (CMNA) or Corning Medical Europe (CME) engineers. To order a part from CMNA use only the nine digits and ignore the check letter; to order a part from CME, ignore the first digit and use only the remaining eight digits and the check letter.

For example:

9001 42 598J Input socket filter, 6A

To order from CMNA quote 9001 42 598

To order from CME quote 001 42 598J

6.2 Engineers Spares Kit (CME)

The following is the CME Engineers Spares Kit for the 925/926, quantities are those supplied in the Kit. Item Nos. refer to EV1.

| Item No. | Cat. No. | Description | Quantity |
|----------|--------------|--|----------|
| - | 9925 20 001A | Engineers Spares Kit | 1 kit |
| 34 | 9001 42 598J | Input socket filter, 6A | 1 |
| 32 | 9001 42 778N | Fuse, 400mA, slo-blo | 5 |
| 25 | 9001 45 207N | Transformer | 1 |
| 22 | 9925 05 006E | Protective boot | 2 |
| 42 | 9925 07 001E | Cableform, PCB to transformer | 1 |
| 21 | 9925 08 001P | Electrode Board assembly | 1 |
| 13 | 9925 09 001L | Motor assembly | 1 |
| 3 | 9925 10 001K | PCB assembly | 1 |
| 7 | 9925 11 002H | One cathode and two detecting electrodes, set of 3 | 3 sets |
| 6 | 9925 11 003J | Anodes, pack of 3 | 3 packs |
| EV2/6 | 9925 20 002X | Extension cable for PCB | 1 |
| - | 9925 89 001F | Service Manual | 1 |
| 33 | 9001 42 743N | Fuseholder | 1 |

| Item No. | Cat. No. | Description | Quantity |
|----------|--------------|---|----------|
| 1 | 9925 04 002X | 925 front panel overlay | 1 |
| 1 | 9926 04 002A | 926 front panel overlay | 1 |
| 2 | 9925 05 016H | Upper front panel | 1 |
| 3 | 9925 10 001K | Printed Circuit Board | 1 |
| 4 | 9001 49 713H | Display LED, pack of 3 | 1 pack |
| 5 | 9925 05 015F | Spacer | 1 |
| 6 | 9925 11 003J | Anodes, pack of 3 | 1 pack |
| 7 | 9925 11 002H | One cathode and two detecting electrodes, 1 set | 1 set |
| 8 | 9925 11 006M | Stirrer | 1 |
| 9 | 9925 11 009A | Beaker, 'Pyrex', graduated at approximately 10ml | 1 |
| 10 | 9925 05 008H | Sample platform | 1 |
| 11 | 9925 05 009J | Sample platform lock | 1 |
| 12 | 9925 05 003P | Lower front panel moulding | 1 |
| 13 | 9925 09 001L | Stirrer motor assembly, including cableform, coupling and 'O' ring | 1 |
| 14 | 9001 42 752P | Connector housing, male, 2 way | 1 |
| 15 | 9001 42 756F | Connector housing, female, 2 way | 1 |
| 16 | 9001 31 058M | 'O' ring | 1 |
| 17 | 9925 09 002M | Coupling | 1 |
| 18 | 9925 05 005X | Insulator | 1 |
| 19 | 9925 05 004A | Motor mounting plate | 1 |
| 20 | 9001 13 001M | Cable grommet | 1 |
| 21 | 9925 08 001P | Electrode board assembly, including cableform | 1 |
| 22 | 9925 05 006E | Protective boot | 1 |
| 23 | 9925 05 007F | Slide bar | 1 |
| 24 | 9965 03 005P | Washer | 1 |
| 25 | 9001 45 207N | Transformer | 1 |
| 26 | 9001 08 503P | Cage nut | 1 |
| 27 | 9925 05 002N | Base | 1 |
| 28 | 9001 30 013N | Foot, self adhesive | 1 |
| 29 | 9925 05 010N | Back strut, for instruments BELOW Serial Nos. 925/1551 and 926/1121 | 1 |
| 29 | 9925 05 021X | Back strut, for instruments ABOVE Serial Nos. 925/1550 and 926/1120 | 1 |
| 30 | 9925 04 006J | 925 side panel, orange | 1 |
| 30 | 9926 04 003X | 926 side panel, grey | 1 |
| 31 | 9925 05 011P | Blanking plate | 1 |
| 32 | 9001 42 778N | Fuse, 400mA, slo-blo | 1 |
| 33 | 9001 42 743N | Fuseholder | 1 |
| 34 | 9001 42 598J | Input socket filter, 6A | 1 |
| 35 | 9925 06 002K | Mounting plate, for instruments BELOW Serial Nos. 925/1551 and 926/1121 | 1 |
| 35 | 9925 13 002N | Mounting plate, for instruments ABOVE Serial Nos. 925/1550 and 926/1120 | 1 |
| 36 | 9925 04 007K | 925 side panel, orange | 1 |

| | | | |
|----|--------------|--|---|
| 36 | 9926 04 004E | 926 side panel, grey | 1 |
| 37 | 9001 10 028K | Serial plate | 1 |
| 38 | 9001 42 498X | Supply cable, with socket | 1 |
| 39 | 9925 04 003E | Rear panel, for instruments BELOW Serial Nos. 925/1551 and 926/1121 | 1 |

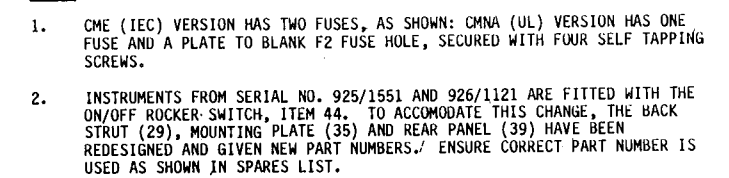
| Item No. | Cat. No. | Description | Quantity |
|----------|--------------|--|----------|
| 39 | 9925 04 011E | Rear panel, for instruments ABOVE Serial Nos. 925/1551 and 926/1121 | 1 |
| 40 | 9001 42 750M | Contact pin, pack of 50 | 1 pack |
| 41 | 9001 42 749H | Contact socket, pack of 50 | 1 pack |
| 42 | 9925 07 001E | Cableform, complete, PCB to transformer | 1 |
| 43 | 858 040 001 | Line cord, CMNA | 1 |
| 44 | 9001 41 456J | On/off rocker switch | 1 |
| 101 | | Screw, M4 x 6, pan head | |
| 102 | | Washer, M4, wavey | |
| 103 | | Screw, M3 x 8, pan head | |
| 104 | | Washer, M3, wavey | |
| 105 | | Washer, M3, plain | |
| 106 | | Screw, M4 x 10, pan head | |
| 107 | | Washer, M4, plain | |
| 110 | | Nut, M4 | |
| 111 | | Screw, self tap No. 4 x 5/16" pan head | |
| 112 | | Screw, M4 x 12, pan head | |
| 113 | | Screw, M4 x 16, pan head | |
| 114 | | Screw, M4 x 10, pan head | |
| 115 | | Washer, M4, nylon | |
| 116 | | Screw, M4 x 8, pan head | |
| 117 | | Screw, M3 x 8, pan head, brass | |
| 118 | | Screw, M3 x 10 | |

NOTE Item numbers 108 and 109 are not used.

FIELD SERVICE KIT (CMNA)

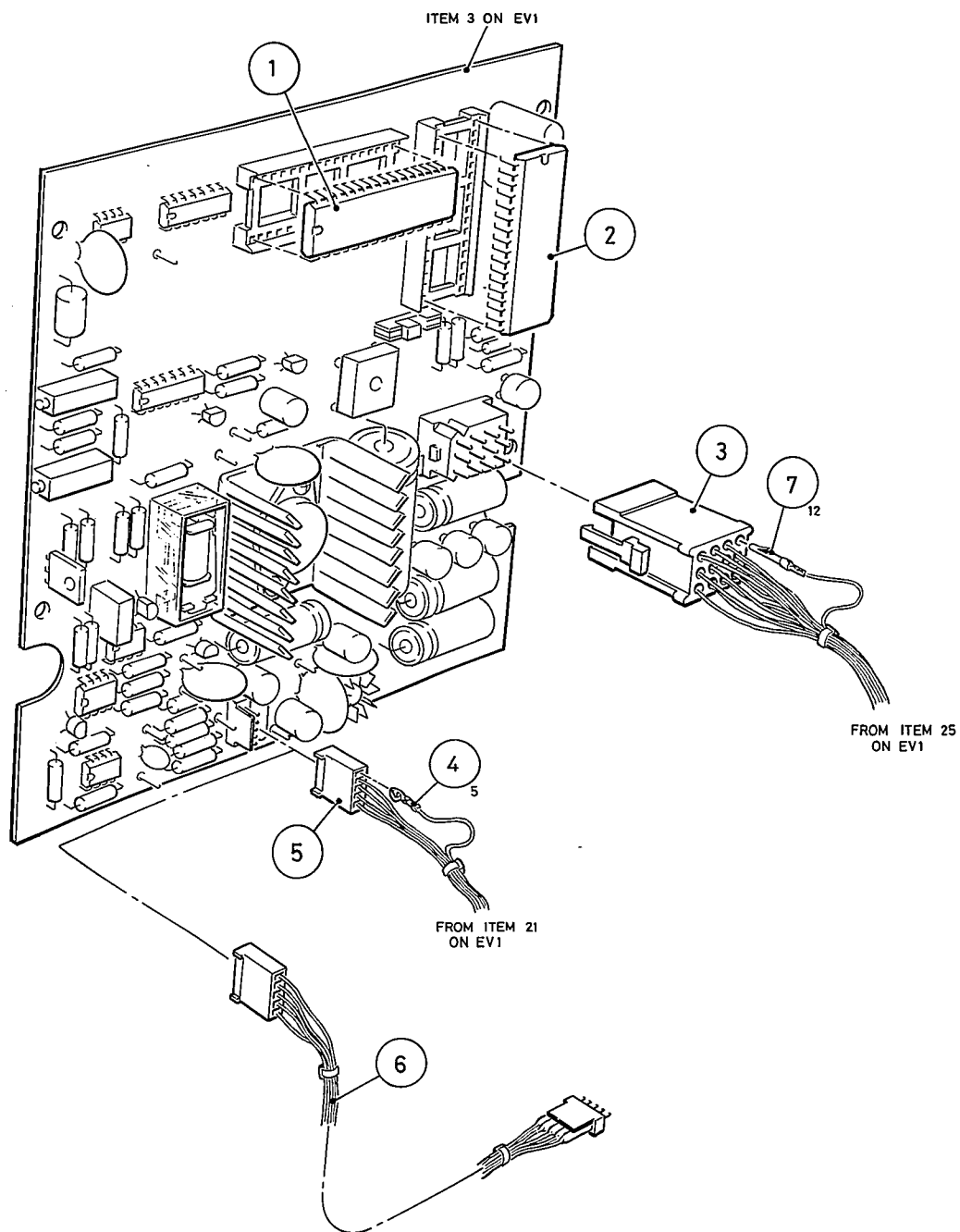
| | | |
|----|-------------|--|
| - | 005 470 001 | 925 Field Service Kit |
| 3 | 9925 10 001 | Printer Circuit Board |
| 13 | 9925 09 001 | Stirrer Motor Assembly |
| 6 | 9925 11 003 | Anodes, 3 Pack |
| 7 | 9925 11 002 | Electrode Set, 1 Cathode and 2 Detectors |
| 8 | 9925 11 006 | Stirrer |
| 17 | 9925 09 002 | Coupling |
| 16 | 9001 31 058 | 'O' Ring |
| 4 | 9001 49 713 | Display LED, 3 Pack |
| 32 | 9001 42 778 | Fuse, 400MA S.B. |
| 21 | 9925 08 001 | Electrode Board Assembly |
| 22 | 9925 05 006 | Protective Boot |
| 33 | 9001 42 743 | Fuse Holder |
| D2 | 9001 49 718 | LED Green (Power) |
| D3 | 9001 49 719 | LED Yellow (micro sample) |
| D4 | 9001 49 717 | LED Yellow (Change reagents) |
| - | 9925 89 001 | Service Manual |



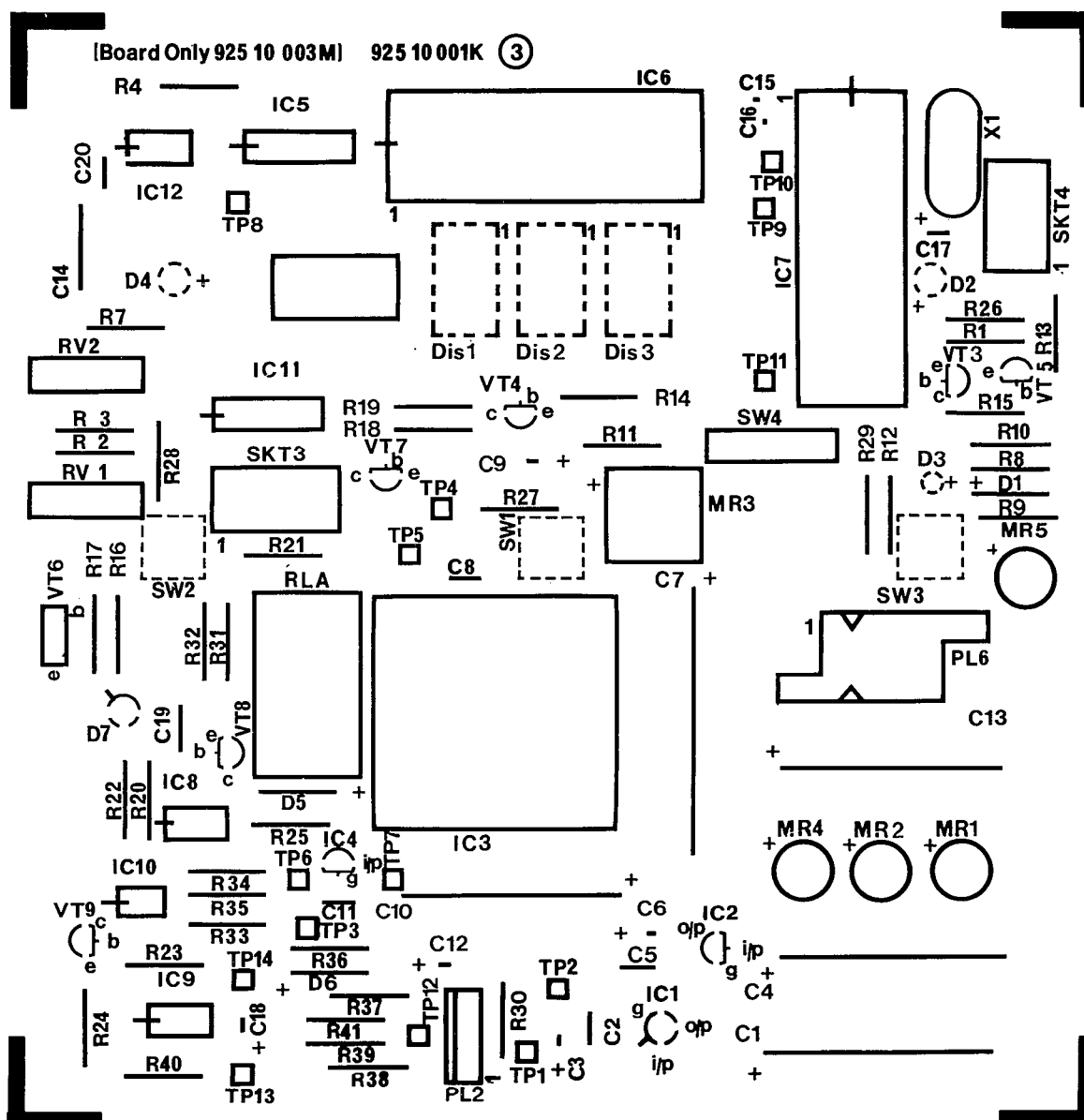


925/926 Serv. Man.
Rev. B June 1981

| Item No. | Cat. No. | Description | Quantity |
|----------|--------------|---------------------------------|----------|
| 1 | 9001 49 714J | IC M7212, Decoder/Driver | 1 |
| 2 | 9925 10 010L | IC C8748-8, micro computer | 1 |
| 3 | 9001 42 755E | Connector housing, male, 12 way | 1 |
| 4 | 9001 42 745A | Crimp terminal | 1 |
| 5 | 9001 42 773H | Connector housing, 5 way | 1 |
| 6 | 9925 20 002X | Extension cable for PCB | 1 |
| 7 | 9001 42 749H | Contact socket, pack of 50 | 1 pack |







NOTE From Instrument Serial Nos. 925/1551 and 926/1121 SW4 is replaced by a selector link. A 20/50 sample selector link is also fitted from these serial numbers.

NOTE The quantity supplied against the Cat. No. is for one only unless stated otherwise.

| Cat. Ref. | Cat. No. | Description |
|-----------|----------|-------------|
| Item No. | | |

ACCESSORIES

| | | |
|---|--------------|--------------------------------------|
| - | 9001 08 081H | Interlocking bead |
| - | 9001 49 054L | Transistor accessory mounting spacer |
| - | 9001 49 239J | Transistor accessory heat sink |
| - | 9001 49 629M | Heatsink |
| - | 9925 10 008E | LED spacer |
| - | 9925 10 009F | LED spacer |

BRIDGE RECTIFIERS

| | | |
|-----------|--------------|------------------------|
| MR1,2,4,5 | 9001 49 715K | Bridge rectifier, 1.5A |
| MR3 | 9001 49 716L | Bridge rectifier, 2A |

CAPACITORS

| | | |
|--------|--------------|---------------------------|
| C1 | 9001 47 202N | 470uF, 35V electrolytic |
| C2 | 9001 47 146K | 0.1uF, 30V, ceramic |
| C3 | 9001 47 529P | 33uF, 25V electrolytic |
| C4 | 9001 47 202N | 470uF, 35V electrolytic |
| C5 | 9001 47 146K | 0.1uF, 30V, ceramic |
| C6 | 9001 47 529P | 33uF, 25V, electrolytic |
| C7 | 9001 47 336X | 4700uF, 16V, electrolytic |
| C8 | 9001 47 146K | 0.1uF, 30V, ceramic |
| C9 | 9001 47 529P | 33uF, 25V, electrolytic |
| C10 | 9001 47 202N | 470uF, 35V, electrolytic |
| C11 | 9001 47 146K | 0.1uF, 30V, ceramic |
| C12 | 9001 47 529P | 33uF, 25V, electrolytic |
| C13 | 9001 47 202N | 470uF, 35V, electrolytic |
| C14 | 9001 47 291H | 3300pF, 160V, polyester |
| C15,16 | 9001 47 530F | 22pF, 100V, ceramic plate |
| C17,18 | 9001 47 191A | 10uF, 25V, tantalum bead |
| C19 | 9001 47 174P | 0.47uF, 63V, polyester |
| C20 | 9001 47 146K | 0.1uF, 30V, ceramic |

CRYSTAL

| | | |
|----|--------------|----------------|
| X1 | 9001 53 283P | Crystal, 3 MHz |
|----|--------------|----------------|

DIODES

| | | |
|------|--------------|--|
| D1 | 9001 49 181F | 1N4007 |
| D2 | 9001 49 718N | LED, Green, 'power' |
| D3 | 9001 49 719P | LED, Yellow, 'micro sample' - 925 or 'mg% salt' - 926 |
| D4 | 9001 49 717M | LED, Yellow, 'change reagents' |
| D5,6 | 9001 49 207M | 1N4148 |
| D7 | 9001 49 705H | AD580J |

DISPLAYS

| | | | |
|-----------|--------------|------------------------|--------|
| DIS 1,2,3 | 9001 49 713H | Display LED, pack of 3 | 1 pack |
|-----------|--------------|------------------------|--------|

| Cct. Ref. Item No. | Cat. No. | Description |
|----------------------------|--------------|-----------------------------|
| <u>INTEGRATED CIRCUITS</u> | | |
| IC1 | 9001 49 708L | LM78L15CH |
| IC2 | 9001 49 707K | LM79L15ACZ |
| IC3 | 9001 49 237F | 5V Regulator |
| IC4 | 9001 49 709M | LM78L12CZ |
| IC5 | 9001 49 706J | SN74LS14N |
| IC6 | 9001 49 714J | M7212, Demultiplexer/Driver |
| IC7 | 9925 10 010L | C8748-8, micro computer |
| IC8 | 9001 49 155X | 741 |
| IC9 | 9001 49 710X | CA3140E |
| IC10 | 9001 49 720F | 4N28, opto coupler |
| IC11 | 9001 49 693J | SN74LS04N |
| IC12 | 9001 49 727P | M7555 |

LINKS

NOTE Two links are fitted from Serial Nos. 925/1551 and 926/1121, one for selection of 925/926 mode of operation and one for 20/50 sample mode.

| | | |
|-------|--------------|---------------|
| LK1,2 | 9001 42 682X | Link Selector |
|-------|--------------|---------------|

PLUGS

| | | |
|-----|--------------|----------------------|
| PL2 | 9001 42 768L | 5 way, PCB mounting |
| PL6 | 9001 42 747E | 12 way, PCB mounting |

POTENTIOMETERS

| | | |
|-------|--------------|----------------|
| RV1,2 | 9001 43 976X | 50k, multiturn |
|-------|--------------|----------------|

RELAY

| | | |
|-----|--------------|-------------------------------------|
| RLA | 9001 51 110K | 2 pole C/O, d.c. coil, PCB mounting |
|-----|--------------|-------------------------------------|

RESISTORS

NOTE All resistors are 2%, 1/2W unless stated otherwise.

| | | |
|--------|--------------|------|
| R1 | 9001 46 033A | 220 |
| R2,3 | 9001 46 082N | 24k |
| R4 | 9001 46 047K | 820 |
| R7 | 9001 46 033A | 220 |
| R8 | 9001 46 001F | 10 |
| R9 | 9001 46 097J | 100k |
| R10 | 9001 46 073M | 10k |
| R11 | 9001 46 049M | 1k |
| R12 | 9001 46 033A | 220 |
| R13 | 9001 46 049M | 1k |
| R14 | 9001 46 088H | 43k |
| R15 | 9001 46 080L | 20k |
| R16 | 9001 46 001F | 10 |
| R17,18 | 9001 46 053H | 1.5k |
| R19 | 9001 46 073M | 10k |
| R20 | 9001 46 121A | 1M |
| R21 | 9001 46 073M | 10k |

| Cct. Ref. Item No. | Cat. No. | Description |
|-----------------------|--------------|----------------|
| R22 | 9001 46 049M | 1k |
| R23 | 9001 46 069X | 6.8k |
| R24 to 29 | 9001 46 049M | 1k |
| R30 | 9001 46 035E | 270 |
| R31 | 9001 46 021L | 68 |
| R32 | 9001 46 080L | 20k |
| R33 | 9001 46 047K | 820 |
| R34 | 9001 46 069X | 6.8k |
| R35 | 9001 46 325X | 2.7M, 5%, 1/2W |
| R36 | 9001 46 060F | 3k |
| R37 | 9001 46 043E | 560 |
| R38 | 9001 46 037H | 330 |
| R39 | 9001 46 056L | 2k |
| R40 | 9001 46 025A | 100 |
| R41 | 9001 46 056L | 2k |

NOTE Circuit references R5 and R6 are not used.

SOCKETS

| | | |
|---|--------------|--------------------------------------|
| - | 9001 42 740K | 40 way, DIL socket for IC6 and IC7 |
| - | 9001 42 536E | 14 way, DIL socket for DIS 1,2 and 3 |

SWITCHES

| | | |
|-----------|--------------|---|
| SW1 and 2 | 9001 41 436X | SPST, momentary action, 'titrate' and 'condition' |
| SW3 | 9001 41 437E | SPST, latching, '20ul sample' - 925; 'mg% salt' - 926 |
| SW4 | 9001 41 205M | Single pole, slide, 925/926 selector, fitted to instruments up to Serial Nos. 925/1550 and 926/1120 only. |

TEST POINTS

| | | |
|-------------|--------------|-----|
| TP1 to TP14 | 9001 02 029L | Pin |
|-------------|--------------|-----|

TRANSISTORS

| | | |
|-----------|--------------|--------|
| VT3 and 4 | 9001 49 200X | 2N3904 |
| VT5 | 9001 49 669J | PSA13 |
| VT6 | 9001 49 139X | 2N4920 |
| VT7 | 9001 49 211H | 2N3906 |
| VT8 | 9001 49 669J | PSA13 |
| VT9 | 9001 49 200X | 2N3904 |

